

Supporting Application Development on J2ME Platform

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Abstract: The Symbian operating system was considered to be the undisputed Kaiser of mobile platforms for many years. The concept of a large screen, data-centric device which runs applications does not seem revolutionary now, but it was Symbian that had initiated these advancements in the world of mobile technology. Symbian operating system was considered to be among the top operating systems until the development of Android. Java offers unrivaled potential for mobile developers worldwide. The Java 2 Platform, Micro Edition (J2ME) provides a rich and robust environment for the development of applications that run on mobile devices. J2ME uses the Java Virtual Machine (JVM) which is completely different from Dalvik Virtual Machine which is used by Android. Thus, many mature Android applications cannot be run on the J2ME platform. Currently there is no technology available for the conversion of Android applications to J2ME applications. It can be done by building an interactive converter system. This will therefore facilitate the conversion of Android applications to J2ME applications, thus supporting the development of the J2ME platform. By doing so, we can not only protect the existing investment but also enrich the J2ME platform.

Index Terms Android, J2ME, JVM, Dalvik.

I. INTRODUCTION

Java 2 'Micro Edition' (J2ME) is a Java-based application platform for mobile devices developed by Sun Microsystems which was later acquired by Oracle Corporation in 2010. Oracle defined the basics for Java ME technology to fit a limited environment and make it possible to create Java applications running on small devices including mobile phones. J2ME is a Java platform designed for embedded systems such as mobile devices. J2ME devices implement a profile, out of which the most common are the Mobile Information Device Profile aimed at mobile devices, such as cellular phones, and the Personal Profile aimed at consumer products and embedded devices like PDAs (Personal Digital Assistant) and set-top boxes. Target devices include mobile phones (especially feature phones) as well as industrial controls and set-top boxes. This paper will primarily focus on the conversion of Android applications to J2ME applications which will be able to run on Java enabled mobile phones. The main objective is to develop applications for J2ME platform.

II. J2ME ARCHITECTURE

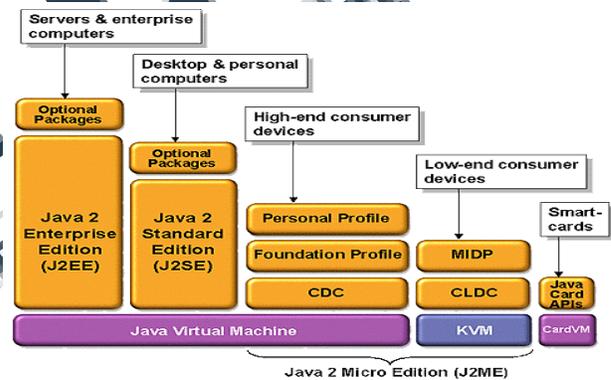


Fig. 1: J2ME Architecture

The J2ME architecture comprises of a variety of configurations, profiles and optional packages that implementors and developers can choose, and combine to construct a complete Java runtime environment that closely fit the requirements of a particular range of devices and a target market. The architecture includes -

- a) *J2EE (Java 2 Enterprise Edition)*: It provides an API and runtime environment for developing and running enterprise software.
- b) *J2SE (Java 2 Standard Edition)*: Majority of the

functionality in CLDC and CDC is inherited from J2SE.

c) *CDC (Connected Device Configuration)*: This configuration includes a comprehensive set of Java libraries and virtual machine features.

d) *CLDC (Connected Limited Device Configuration)*: It is designed specifically to fit the needs of small-footprint devices.

e) *MIDP (Mobile Information Device Profile)*: It is aimed at lower-end consumer devices such as mobile phones.

f) *KVM (K Virtual Machine)*: It supports a subset of the features of the higher end JVM.

g) *JVM (Java Virtual Machine)*: JVM implementation, together with the standard libraries, forms the Java Runtime Environment (JRE) and is the code execution component of the Java platform.

h) *CardVM*: It gives the user the ability to program the devices and make them application specific.

III. NECESSITY FOR DEVELOPING J2ME APPLICATIONS

J2ME offers unrivaled potential for mobile developers worldwide. It provides a rich and robust environment for the development of applications that run on mobile devices. Java ME provides a resilient set of technologies for running applications on mobile and embedded devices like mobile phones, industrial controls and set-top boxes. Applications based on J2ME specifications are written once for a wide range of devices. J2ME provides an option for developing games for mobile phones, which can be emulated on PCs during the development stage and easily uploaded onto phones. With the emergence of Android, the demand for J2ME phones is decreasing at an alarming rate. In comparison to Android, Symbian (J2ME) phones provide better features in terms of memory management, power management, multitasking and so on. Thus, it has become a necessity to develop J2ME applications in order to make people realize the benefits that Symbian phones have over Android phones.

IV. PROCESS FOR ANDROID TO J2ME CONVERSION

The figure below gives an overview of the process for conversion of Android applications to J2ME applications.

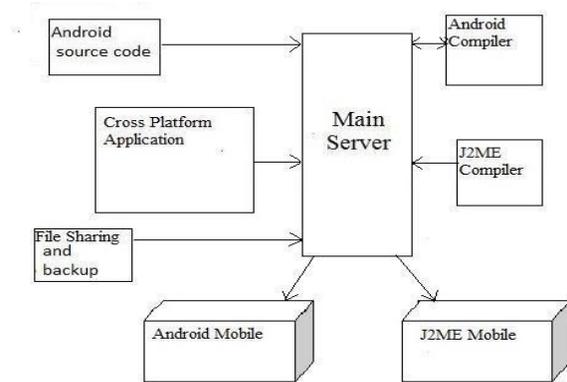


Fig. 2: General Overview of the Conversion Process

The overall detailed working of the conversion process can be illustrated as below –

Step 1: The apk source code file consisting of the xml layout and java activity files is taken as input.

Step 2: It is then tokenized and a parse tree is generated using top-down parsing. Then hierarchical nodes are generated using the document builder.

Step 3: The mapping function then maps the hierarchically arranged Android nodes to the corresponding J2ME nodes using method mapping, object mapping, etc.

The mapping function uses hierarchical mapping instead of one-to-one mapping. The reason for this can be understood from the figure given below –

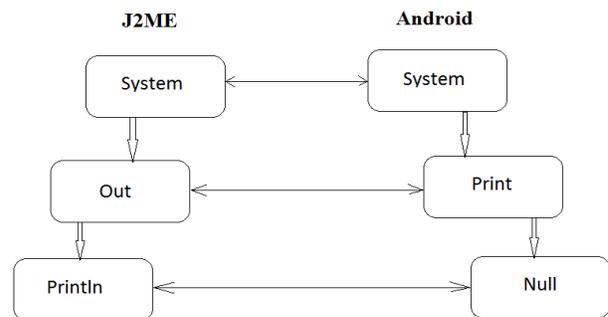


Fig. 3: Problem with one-to-one mapping

Step 4: The JAR Generator will then create an executable, compiled .jar file which will run on a J2ME mobile.

The figure given below shows this process in brief-

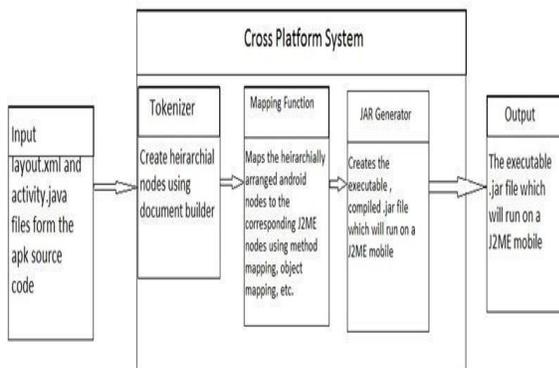


Fig. 4: Process for Android to J2ME conversion

V. BENEFITS OF DEVELOPING J2ME APPLICATIONS

J2ME mobile development is more suited for smart mobile applications and provides following advantages:

- Low cost of mobile app development because of open source nature.
- Peer-to-peer (P2P) networking.
- High degree of consistency and security across platforms and mobile devices.
- Ability to function off-line, outside wireless coverage area.
- Excellent user interface with graphics.

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J2ME supports persistent storage of data which is enough to save configuration data constantly for current and future mobile applications. Building an interactive converter system will facilitate the operation of an application on two different

mobile operating systems at the same time. Also, the developer's efforts would not go waste as it is possible to run the application on multiple platforms. So, if one platform does not support one particular application, it can be run on another platform. Also, consumers will be able to avail the benefits of different applications on a single mobile phone.

VI. CONCLUSION AND FUTURE SCOPE

Developing for J2ME is both similar to, and different from, developing for Android — and both are rather different from developing desktop Java applications. We can have platform independent applications by creating a medium for conversion of Android applications to J2ME applications. We can also have inter-conversion of Android, J2ME, Blackberry applications using a similar process. This also minimizes the need for buying expensive mobile phones.

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